Air Accident Investigation Unit Ireland

FACTUAL REPORT

SERIOUS INCIDENT
Airbus A319-112, D-AIBC
Dublin Airport
27 November 2015

An Roinn Iompair
Turasóireachta agus Spóirt

Department of Transport,
Tourism and Sport

Foreword

This safety investigation is exclusively of a technical nature and the Final Report reflects the determination of the AAIU regarding the circumstances of this occurrence and its probable causes.

In accordance with the provisions of Annex 13[1] to the Convention on International Civil Aviation, Regulation (EU) No 996/2010[2] and Statutory Instrument No. 460 of 2009[3], safety investigations are in no case concerned with apportioning blame or liability. They are independent of, separate from and without prejudice to any judicial or administrative proceedings to apportion blame or liability. The sole objective of this safety investigation and Final Report is the prevention of accidents and incidents.

Accordingly, it is inappropriate that AAIU Reports should be used to assign fault or blame or determine liability, since neither the safety investigation nor the reporting process has been undertaken for that purpose.

Extracts from this Report may be published providing that the source is acknowledged, the material is accurately reproduced and that it is not used in a derogatory or misleading context.

[1] **Annex 13**: International Civil Aviation Organization (ICAO), Annex 13, Aircraft Accident and Incident Investigation.
[2] **Regulation (EU) No 996/2010** of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation.
[3] **Statutory Instrument (SI) No. 460 of 2009**: Air Navigation (Notification and Investigation of Accidents, Serious Incidents and Incidents) Regulations 2009.

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In accordance with Annex 13 to the Convention on International Civil Aviation, Regulation (EU) No 996/2010 and the provisions of SI 460 of 2009, the Chief Inspector of Air Accidents on 30 November 2015, appointed Mr. Kevin O'Ceallaigh as the Investigator-in-Charge to carry out an Investigation into this Serious Incident and prepare a Report.

Aircraft Type and Registration:	**Airbus A319-112, D-AIBC**	
No. and Type of Engines:	**2 x CFM56-5B6/3**	
Aircraft Serial Number:	**4332**	
Year of Manufacture:	**2010**	
Date and Time (UTC)[4]:	**27 November 2015 @ 17.53 hrs**	
Location:	**Dublin Airport**	
Type of Operation:	**Commercial Air Transport/ Scheduled Passenger**	
Persons on Board:	**Crew - 5**	**Passengers - 104**
Injuries:	**Crew - 0**	**Passengers - 0**
Nature of Damage:	**Auxiliary Power Unit (APU) removed and Internal components replaced**	
Commander's Licence:	**Airline Transport Pilot Licence issued by the German Luftfahrt Bundesamt (LBA)**	
Commander's Details:	**Male, aged 47 years**	
Commander's Flying Experience:	**16,973 hours, of which 7,871 were on type**	
Notification Source:	**Dublin Airport Authority (DAA) Duty Manager**	
Information Source:	**AAIU Report Form submitted by the Commander, AAIU Field Investigation**	

[4] **UTC**: Co-ordinated Universal Time. All timings in this report are quoted in UTC (equivalent to local time).

SYNOPSIS

At the commencement of a scheduled passenger flight from Dublin (EIDW) to Munich, Germany (EDDM), the aircraft, an Airbus A319-112, began the pushback and engine start procedure from parking stand 306L at EIDW. The No. 2 engine failed to start and the aircraft was towed back onto stand. When the aircraft had returned to the stand, the Cabin Crew reported to the Flight Crew that there was smoke in the cabin. The aircraft Commander declared a 'Mayday' by radio to Air Traffic Control (ATC) and directed the Cabin Crew to prepare for an emergency evacuation. The Flight Crew commenced the aircraft checklist for emergency evacuation. Following completion of this checklist it was noted that the smoke had begun to dissipate from the cabin. Because of this the aircraft Commander elected to disembark the passengers normally via the airbridge. There were no injuries.

NOTIFICATION

The AAIU Inspector on Call (IOC) was notified by the Dublin Airport Authority (DAA) Duty Manager at 18.05 hrs on 27 November 2015. A report was subsequently submitted to the Irish Aviation Authority.

1. FACTUAL INFORMATION

1.1 History of the Flight

The aircraft departed EDDM at 14.35 hrs on 27 November 2015. It landed at EIDW at 16.50 hrs and parked on stand 306L. The passengers disembarked and the crew completed the necessary checklist items to prepare the aircraft for the next sector from EIDW to EDDM.

Once the passengers had boarded, the aircraft commenced pushback from its parking stand at 17.40 hrs. The Flight Crew began the engine start procedure as the pushback was in progress. During the engine start procedure the No. 2 engine failed to start. The Commander reported that this was due to a lack of sufficient bleed air pressure being delivered to the engine from the APU. At 17.45 hrs the Flight Crew called ATC to request permission to return to stand 306L. The aircraft was towed back onto the parking stand, the parking brake was applied and the Cabin Crew were informed of events.

At 17.52 hrs, after the aircraft had stopped on stand, the Purser[5] called the cockpit to report that there was some smoke visible in the cabin. The Commander opened the cabin door, observed the smoke and considered the use of the 'Emergency Evacuation' checklist. The Cabin Crew notified the Commander that the cabin door emergency slides had already been placed from the 'armed'[6] to the 'manual' position. The Commander instructed the Purser to return the doors to the 'armed' position and declared a 'Mayday' by radio to (ATC).

[5] **Purser:** The title given by the operator to the senior cabin crew member on board the aircraft.
[6] **Armed**: The aircraft doors have an escape slide integrated into the opening mechanism. When in the 'armed' position the slides will be automatically inflated by compressed gas when the door is opened. When in the 'manual' position the slide will not deploy automatically.

He shut down the APU and discharged a fire extinguisher bottle into the APU compartment as a precaution. There was no cockpit indication of a fire in the APU. The Airport Fire Service (AFS) arrived three minutes after the call to ATC. The AFS chief advised the Commander by radio that there was no sign of smoke or fire outside the aircraft. The Cabin Crew reported to the Commander that the smoke in the cabin was dissipating.

At this point the Flight Crew and Cabin Crew agreed that a full emergency evacuation was not necessary and elected to disarm the emergency slides and disembark the passengers by use of the airbridge. Once the passengers had disembarked, the AFS boarded the aircraft and evaluated the situation. The AFS stood down at 18.41 hrs.

1.2 Injuries to Persons

No injuries were reported to the Investigation.

1.3 APU Information

The APU is a Hamilton Sundstrand APS3200 constant speed gas turbine engine which drives a load compressor and an accessory gearbox. The APU is mounted in a fire-proof compartment in the fuselage tail cone and it provides an independent source of pneumatic air and electrical power both in flight and on the ground. The pneumatic air can be used for air conditioning and to provide compressed air for starting the main engines.

The APU has an integral oil system which cools, cleans and lubricates the APU bearings, accessory gearbox and gearbox-mounted generator. During normal operation the oil, which becomes heated while cooling the APU components, is directed through an oil/air cooler (**Photo No. 1**).

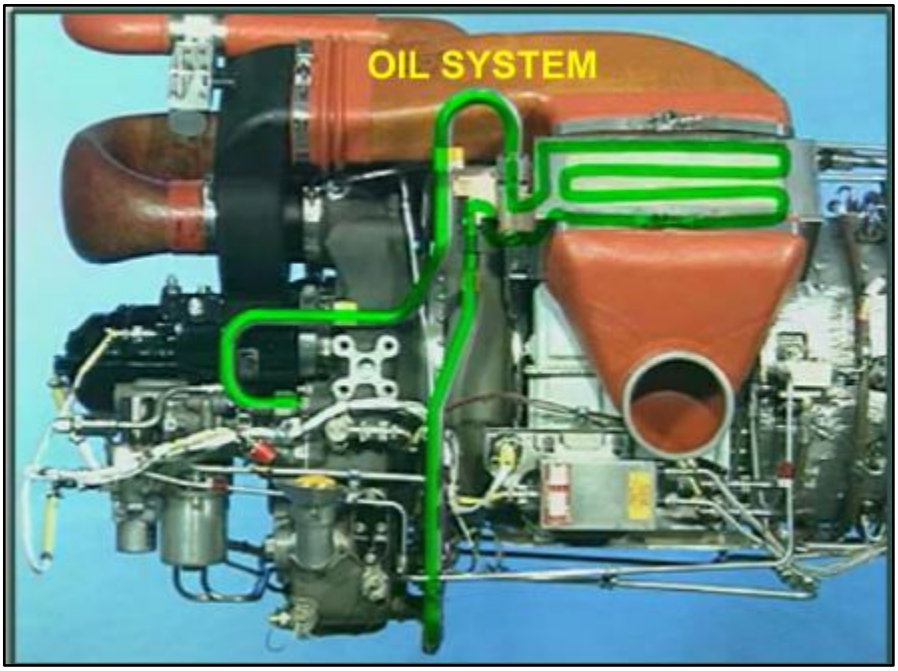

Photo No. 1: APU Oil System; the path of oil flow through Oil/Air Cooler is highlighted in Green (Airbus)

The oil/air cooler acts as a heat exchanger by using cold external air flowing across a series of pipes to cool the oil, while at the same time providing a heating function to the airflow to assist the combustion process within the engine.

1.4 Immediate Repair Actions

Once the passengers had disembarked, maintenance personnel attempted to identify the cause of the smoke in the cabin. The AAIU Inspectors arrived during this troubleshooting effort. Upon boarding the aircraft the Inspectors noted that there was no smell or signs of smoke in the cabin or cockpit.

The maintenance personnel decided to start the APU. The APU was started again in the presence of the AFS, as the APU fire bottle had previously been discharged by the Commander. Although the APU started successfully, during the process the cabin filled with smoke (see **Photo No. 2)**. The APU was shut down. There was no indication of exterior damage to the APU. However, it was noted that there was oil visible on the outside of the rear fuselage and APU compartment door.

Photo No. 2: The aircraft cabin approx. one hour after the APU test was conducted

The APU was declared unserviceable in order to prevent the possibility of further smoke entering the cabin. The aircraft was flown to a suitable facility where a number of maintenance actions were carried out by the Operator. These included removal and replacement of the APU and a post-maintenance test flight. The aircraft was returned to service and the Investigation was informed by the Operator that there have been no further reports of smoke in the cabin during subsequent flights.

1.5 Personnel Information

The Commander held an Airline Transport Pilots Licence (ATPL) issued under EASA part FCL requirements by the LBA of Germany. He held a valid type and instrument rating and was also qualified as a Type Rating Instructor (TRI) on the Airbus A319/320/321 aircraft. The Commander was in possession of a valid Class 1 medical certificate. He had a total of 16,973 flight hours including 7,871 hours on type. At the time of the occurrence he had flown for 2.42 hours since the start of his duty period.

The Co-pilot was the holder of an ATPL issued under EASA part FCL requirements by the LBA of Germany. He held a valid type and instrument rating and was also qualified as a TRI on the Airbus A319/320/321 aircraft. The co-pilot was in possession of a valid Class 1 medical certificate. The co-pilot was in possession of a valid Class 1 medical certificate. He had a total of 7,727 flight hours, all of which were on type. At the time of the occurrence he had flown for 2.42 hours since the start of his duty period.

1.6 Subsequent APU Inspection

The Operator conducted a further inspection of the removed APU at the Operator's APU overhaul facility in order to identify the source of the smoke. Oil contamination was found in the intake plenum[7], APU lines and ducts (See **Figure No. 1**) and the LOP[8] tube. The APU was disassembled in order to access and replace the plenum, APU ducts and LOP tube. Following a test run of the APU, it was noted that there was oil leaking in the area of the oil cooler. A gearbox lip seal was replaced and the APU was successfully run without further leakage.

1.7 The Engine Start Procedure

The Commander stated that during the engine start procedure there was an indication on the cockpit instruments of low APU bleed air pressure. It is likely that this engine start failed because of the absence of bleed air to accelerate the engine to sufficient speed for the combustion process to become self-sustaining. An examination of the APU concluded that the lack of bleed pressure was probably caused as a result of a malfunctioning inlet air temperature and pressure sensor (see **Figure No. 1**). Although they appear separately in the schematic, both sensors are physically located within the area of the air intake plenum which was contaminated with oil. The sensors were replaced. It was noted that there was no history of low APU bleed pressure events prior to this occurrence and the APU operated normally after the maintenance was completed.

[7] **Plenum:** A component of a gas turbine engine, designed to hold air at a pressure slightly higher than that of the surrounding air.

[8] **LOP:** Low Oil Pressure

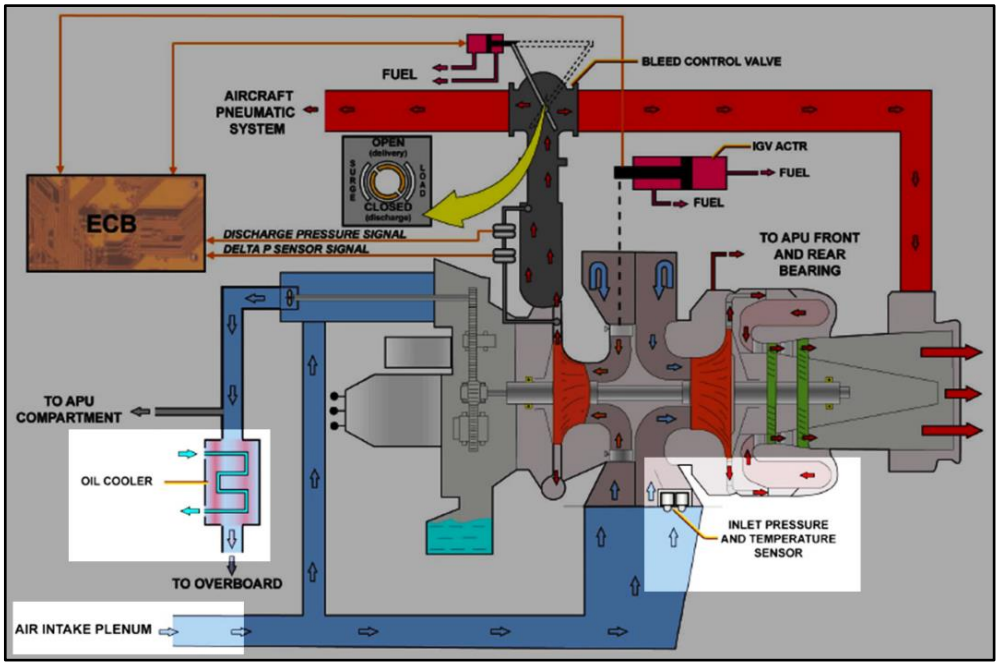

Figure No. 1: APU Schematic highlighting the air intake plenum, oil cooler and inlet pressure and temperature sensor (Airbus)

2 AAIU COMMENT

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The appropriate Crew responses and Commander's decisions minimised the effect on the passengers by acting promptly to prevent further smoke from entering the cabin. The Commander's decision to disembark the passengers by use of the air bridge eliminated the possibility of passenger injury during use of the emergency slides.

It is probable that the leaking oil from the area of the oil cooler was sucked into the airflow by the load compressor and entered the air conditioning system.

This Investigation does not sustain any Safety Recommendations.

- END -

In accordance with Annex 13 to the Convention on International Civil Aviation, Regulation (EU) No. 996/2010, and Statutory Instrument No. 460 of 2009, Air Navigation (Notification and Investigation of Accidents, Serious Incidents and Incidents) Regulation, 2009, the sole purpose of this investigation is to prevent aviation accidents and serious incidents. It is not the purpose of any such investigation and the associated investigation report to apportion blame or liability.

A safety recommendation shall in no case create a presumption of blame or liability for an occurrence.

Produced by the Air Accident Investigation Unit

AAIU Reports are available on the Unit website at www.aaiu.ie

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